

**Oroville Facilities Relicensing Efforts
Environmental Work Group
Draft Narrative Reports for Resource Action Discussion**

Resource Action: EWG-18
Resource Action: EWG-90

Task Force Recommendation Category: 2
Task Force Recommendation Category: 4

Proposed Ripping and/or Raking of Selected Sections in the Low Flow Channel of the Feather River for Enhancement of Salmon and Steelhead Spawning Habitat

Date of Field Evaluation: No field investigation has been conducted. This measure was discussed at a meeting at DWR Red Bluff on August 15, 2003

Evaluation Team: Richard Harris and Koll Buer

Description of Potential Resource Action Measure:

In areas where armoring has occurred, selected sections of the low-flow reach of the Feather River would be ripped and/or raked with the goal of improving spawning gravel quality for Chinook salmon and steelhead. No specific locations have been determined pending the results of Study Plan, SP-G2.

This measure is directly related to EWG-92 that would supplement gravel in the low flow reach.

Nexus to the Project:

Lake Oroville prevents the movement of gravel from upstream sources to the lower Feather River. As a consequence of this, there is no significant recruitment of gravel that is of suitable sizes for use by spawning anadromous salmonids. Regulation of flows and scouring of suitably sized gravel from the low flow reach has further reduced the areal extent of spawning habitat.

Potential Environmental Benefits:

The intention of this measure is to increase the area of suitable salmonid spawning habitat in the low flow reach. This in turn, would reduce the incidence of redd superimposition and improve spawning success.

Potential Constraints:

The only major constraint to this measure would be the possibility of short-term impacts on water quality due to equipment operation in the river.

Existing Conditions in the Proposed Resource Action Implementation Area:

Because of water temperature constraints elsewhere, the low flow channel is currently the only portion of the lower Feather River suitable for year-around rearing of juvenile salmonids and is, by far, the most important section of the river for salmon and steelhead spawning.

Areas suitable for spawning in the low flow reach are well-established stable riffles. All the major ones have names. They have changed very little in location since closure of Lake Oroville. However, most riffles have coarsened in surface texture over time, a

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process called armoring. This has reduced their value as spawning habitat. Armoring is particularly evident at the heads of riffles, which coincidentally are favored locations for spawning. The degree of armoring was evaluated in surveys done in 1980, 1996 and currently, under SP-G2.

Data exist on subsurface substrate conditions for all major spawning areas. These data indicate that in many locations, gravels of size classes suitable for use in redd construction exist below the armored layer.

There have been some efforts in the past to reduce armoring through ripping or re-arranging spawning gravels. The most significant gravel placements and manipulations were associated with Moe's Ditch, an artificial spawning channel.

Design Considerations and Evaluation:

The most important design consideration for this measure is the quality of gravels underlying the armored layer in the sites designated for treatment. Information on substrate composition for spawning sites will be available from SP-G2 and SP-F10. This measure can be further developed and site selection can proceed when those data have been analyzed.

As briefly discussed below in the Recommendations, this measure could be combined with others as part of a comprehensive approach to spawning habitat improvement. At the minimum, EWG-92 is a complementary measure.

Ripping and raking at spawning sites may require use of heavy equipment. These activities would have the potential to produce water quality problems, particularly high turbidity. Implementation should be restricted to the period of July to mid-August when sensitive life stages of salmonids are least abundant in the river. Permits will be required from the Department of Fish and Game, State Water Quality Control Board and Army Corps of Engineers, at the minimum. NOAA-Fisheries would also have jurisdiction under the ESA.

As with gravel placement, ripping and raking will make temporary improvements in habitat quality that will last as long as there is no extreme flooding event. Flows in excess of 50,000 cubic feet per second (cfs) will probably mobilize gravels of spawning size and return the treated sites to an armored condition. Flows of this magnitude have occurred 12 times in the past 42 years.

One potential method to enhance gravel retention would be to use raked cobbles as upstream berms to protect areas of gravel. Using these in series, analogous to windrows, could protect relatively large patches of gravel from scouring during some peak flow events.

Another design consideration should be emphasizing treatments at upstream riffles. That way, gravels remain in the system for the longest possible time.

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The best measures of success for this measure or any other proposing improvements to spawning habitat would be fish escapement. Additional correlative measures would be redd counts and incidence of superimposition.

Synergism and Conflicts:

This measure, along with others proposing gravel placement and use of instream structures and LWD, could all help improve both spawning and rearing habitat for anadromous salmonids in the low flow reach. However, if all measures with similar objectives (including others proposing alternative flow management) are not planned in concert, they could end up conflicting with each other. Specific treatments should be considered tools for habitat improvements within the context of an overall assessment of habitat improvements.

Uncertainties:

The only major uncertainty associated with this measure would be the extent and duration of short-term water quality impacts. Another uncertainty would be the duration of beneficial effects.

Cost Estimate:

Costs for this measure would probably be relatively low. No materials would be required. The only major cost item would be equipment operation time. It is reasonable to assume a cost of about \$1,600/day for heavy equipment operation. Most existing riffles could probably be treated within about 10 days for a total cost in the range of \$10,000 - \$20,000.

Recommendations:

This proposal represents a reasonable approach to improving spawning habitat if the design considerations can be fulfilled. The proposal should therefore, be limited to sites where the quality of gravel underlying the armored layer is suitable for spawning.

This measure could be undertaken independently or it could be combined with EWG-92 that proposes enhancement of gravel supply to the low flow reach. Under EWG-92 three options are presented including one that would involve direct placement of gravels at spawning sites. There are potential water quality concerns associated with direct placement as there would be with ripping and raking. Nevertheless, if a direct placement option were chosen, it would naturally involve raking at the minimum. If suitable gravels exist below armored layers, ripping could reduce the amount of gravel that would need to be supplied.